Evaluation of integrated approaches to health with a focus on One Health

Rushton, J ; Nielsen, L R ; Cornelsen, L ; Queenan, K ; Rüegg, S R ; Häsler, B

DOI: https://doi.org/10.3920/978-90-8686-875-9

Chapter 1

Evaluation of integrated approaches to health with a focus on One Health

Photo: Kevin Queenan

Jonathan Rushton[1*], Liza Rosenbaum Nielsen[2], Laura Cornelsen[3], Kevin Queenan[4], Simon R. Rüegg[5] and Barbara Häsler[4]

[1]Institute of Infection and Global Health, University of Liverpool, IC2 Building, 146 Brownlow Hill, Liverpool L3 5RF, United Kingdom; [2]Faculty of Health and Medical Sciences, University of Copenhagen, Grønnegårdsvej 8, 1870 Frederiksberg C, Denmark; [3]Department of Global Health and Development, London School of Hygiene and Tropical Medicine, 15-17 Tavistock Place, London, WC1H9SH, United Kingdom; [4]Department of Pathobiology and Population Sciences, Veterinary Epidemiology Economics and Public Health Group, Royal Veterinary College, Hawkshead Lane, North Mymms, Hatfield, Hertfordshire, AL9 7TA, United Kingdom; [5]Section of Epidemiology, Vetsuisse Faculty, University of Zürich, Winterthurerstrasse 270, 8057 Zürich, Switzerland; j.rushton@liverpool.ac.uk

Abstract

One Health is a relatively novel term rooted in long held understandings of the link between diseases shared between humans and animals (zoonoses), and that underlying biological and physiological processes are found across species. Despite these understandings, health provision and research have increasingly become separated into areas of human, animal and environmental health. However, recent emergence of diseases such as BSE, SARs and highly pathogenic avian influenza has raised the need to look at health in a more holistic manner and apply principles of transdisciplinarity to difficult health problems. In some circumstances One Health has come to the fore with the understanding that addressing the health of species and the environment with an intersectoral and transdisciplinary approach will provide additional benefits. The frameworks to assess One Health programmes and projects are not well developed, and the guide this chapter introduces outlines an evaluation framework for One Health activities such as the provision of services, research and education.

Keywords: One Health, intersectoral, transdisciplinarity, evaluation

1.1 Background

The term 'One Health' is relatively novel. However, the concept has long been recognised. For instance, in the 1800s Rudolf Virchow, a German physician, coined the term 'zoonosis' indicating that there were links between humans and animals regarding infectious diseases. In reality, before the 1800's, the medical profession dealt with animal diseases that became epidemic problems, and the veterinary profession emerged out of a societal need towards the end of the 1800s (Wilkinson, 1992). Prior to this period there was the emergence of specialist veterinary schools and much experimental work conducted in physiology and microbiology that cut across species groups. However by the 20th century an increasing separation of medicines was seen (Zinsstag *et al.*, 2005), albeit with the same core underlying biology principles and with some interest in comparative medicine. Possibly the reasons for the separation of medicines has been the ability for disease control to be conducted species by species, and the increasing specialisation of human as well as veterinary medicine in all aspects of specific disease management and individual treatment, population and public health medicine. Chapter 2 provides a good overview of these changes in how One Health is perceived and what it includes.

In the last two decades, there has been a re-emergence of the recognition that a combined approach to health issues is needed, together with an increasing awareness that environmental health affects the health and livelihood of humans, domestic animals and wildlife, and is an important component for sustainability and resilience of the planet. This recognition has led to the emergence of the One Health, EcoHealth, Planetary Health and other integrated health movements, which are discussed in Chapter 2.[2] The drivers of emergence and spread of diseases are rooted in the way we organise our production and use of food,

[2] While we use the term One Health in this book, the principles discussed are relevant for any integrated, systems-based approaches to health.

feed, water and energy for a growing world population (FAO, 2013). One Health initially gained momentum triggered by the threat of major food borne disease problems such as salmonella and bovine spongiform encephalopathy (BSE) and more recently with the zoonotic pandemics threats such as severe acute respiratory syndrome (SARS), cross species influenza and Ebola. Antimicrobial resistance across species and within the general environment is also a growing concern (O'Neill, 2016). This has brought to the fore the need for medical doctors, veterinarians and human and animal health professionals to collaborate. Indeed, the need for wider interdisciplinary collaboration is increasingly recognised in order to address the complex interplay between humans, animals and the environment in the context of disease prevention and control and incorporating both health and welfare issues. In addition to human and animal health practitioners, the role of wildlife biologists, environmentalists, ecologists, anthropologists, economists and social scientists amongst others were included when designing One Health approaches for holistic disease prevention and mitigation strategies (Zinsstag *et al.,* 2015). The use of One Health approaches with a stronger emphasis on the environmental component is growing due to the rapid development of environmental change including exponentially growing world population, urbanisation, deforestation, wildlife and plant species extinctions and global warming.

The strategic direction of One Health is to assess actions and interventions that aim to promote health through common aims and collaboration between disciplines across different species and their environment. The transdisciplinarity of One Health brings with it the challenge of harmonising the definition of health across disciplines and sectors with an underlying core that concerns the importance of people affected by health outcomes be they animal, environmental or human. In this context the definitions of human health outcomes becomes critical and the definition of what is the state of human health that is desirable changes as society evolves and our understanding of our needs is better understood. Commonly used metrics to assess the disease burden for humans both qualitatively and quantitatively, have been the use of either quality adjusted life years (QALY) or disability adjusted life years (DALY) (Murray, 1994), with judgements on interventions on the cost per DALY avoided as a basis for policy change (Drummond *et al.,* 2005). On the other hand, health in domestic or production animals tend to have a strong focus on absence of disease compared to human health due to the links between health and productivity, which have important societal and economic value. The animal health issues can be reduced to monetary values whereas change or intervention can be modelled with a cost-benefit analysis framework similar to other types of investment in society (Gittinger, 1982). Some may contest that not all aspects of livestock and domesticated animals can be monetarised, yet economics has developed methods to place prices on outputs that have no markets, and the zDALY attempts to place the issue of zoonoses into a new framework to capture impact across species (Torgerson *et al.,* 2017). In some countries, welfare measures for animals are employed in legislation and daily management of domesticated animals. These welfare measures have been defined as the five freedoms: (1) freedom from hunger and thirst; (2) freedom from discomfort; (3) freedom from pain, injury and disease; (4) freedom to express (most) normal behaviour; and (5) freedom from fear and distress (FAWC, 2012). Similarly, plant and aquatic animal health can be reduced to monetary terms, yet it has rarely been included or even thought about, even within a One Health context. Finally, environmental or ecosystem health measurement and assessment have been the most creative in the development of methods to define the

value or prices of goods and services that have no market (TEEB, 2015; Winpenny, 1991). Ecosystems services refer the direct and indirect contributions of healthy ecosystems to human well-being. There are three categories: provisioning ecosystem services, regulating and maintenance ecosystem services, and cultural ecosystem services (TEEB, 2015). However this area of environmental health has a relatively poorly developed set of metrics within the human-animal-environment disease triad. Costanza *et al.* (1992) defined ecosystem health as the occurrence of normal ecosystem processes and functions, with a system being free from distress and degradation, which maintains its organisation and autonomy over time and is resilient to stress. The concept of ecosystem health depends on human-social values and desires, and therefore, integrates numerous ecological, social, economic and political factors (Tzoulas *et al.,* 2007). Charron (2012) has explored the how the ecosystem interacts with and established methods for such assessment, and Zinsstag *et al.* (2017) propose extending the Health Impact Assessment framework to a One Health format. These developments are useful processes of innovation, the big step is to incorporate them into legislation systems for the public sector as is the case for cost-benefit analysis or to encourage their use in social charters for private companies.

Across the human-animal-environment system there is a lack of universally accepted methods and metrics to evaluate problems and interventions. In turn this generates a problem of how the added value of One Health actions can be measured (Babo Martins *et al.,* 2015; Cleaveland *et al.,* 2006; Coker *et al.,* 2011) and also how costs to achieve a better societal outcome are borne across society. Capturing changes in human and animal welfare, environment services and economic returns provide a major challenge (Häsler *et al.,* 2014; Manlove *et al.,* 2016). The transdisciplinary nature of One Health makes it difficult to fund as most research funding is focused on specific diseases or disease mechanisms, and redirecting funds rarely takes place unless faced with a crisis emergency situation such as the one lived in the recent Ebola epidemic. Manlove *et al.* (2016) in their analysis of what has so far been published detect separation across different areas of One Health with clustering of activity in ecology and veterinary science and some more diverse work. However, research is expanding in this area at a faster rate than other life sciences when measured by publication output. Yet the question remains whether this is an old approach with a new badge and therefore the need for evaluation methods and metrics to test how holistic and interdisciplinary the research has been.

The increase in research output labelled as One Health reflects a change in funding focus of the major organisations. For example the EU have funded ICONZ[3]; USAID support the four-part emerging pandemic threat programmes[4] PREDICT, PREVENT, IDENTIFY and RESPOND; and the British research councils have funded a zoonotic disease programme (ZELS[5]) with a One Health focus. One Health funding from the private sector is also increasing. For instance, the UK based Wellcome Trust includes a strategic funding section under the name 'Our Planet, Our Health' that supports transdisciplinary research that connects the environment and health. Furthermore, the Bill and Melinda Gates Foundation also funded One Health

[3] https://www.ed.ac.uk/global-health/research/project-profiles/one-health/zoonotic-diseases/iconz.
[4] https://www.usaid.gov/news-information/fact-sheets/emerging-pandemic-threats-program.
[5] https://bbsrc.ukri.org/research/international/engagement/global-challenges/zels/.

projects under the call 'The One Health Concept: Bringing Together Human and Animal Health for New Solutions'. These research funding projects are in stark contrast to the lack of government institutional change and delivery of One Health services and mechanisms. The policy change at present is largely on funding research, rather than changing practices in the delivery of health services in a multi-species and trans-sectoral manner, yet the joint publication by the World Bank and Ecohealth Alliance on operationalization of health systems would indicate that this may be changing (World Bank, 2018).

These initiatives are a start to bring about investments across all species that reflect their relative importance in terms of health outcomes, including humans and the environment. Such an approach needs to recognise that market prices are not a good measure of determining how to achieve a balance across species. Yet measuring the added value from a One Health approach requires both clarity of what should be measured as well as the reason why a change in resource use should be valued. This guide sets out to develop a protocol for the evaluation of One Health and a series of methods to solve this problem and thereby adding greater certainty on the when, where and how One Health activities are needed to promote health in the global society.

1.2 Structure of the guide

The guide contains seven core chapters, which can be read either in isolation or in combination. In order to help the reader the following gives a brief overview of each chapter:

- Chapter 2 describes the existing separate health disciplines and approaches and their dependency on high tech, linear solutions, which are becoming less effective and less sustainable in solving increasingly complex problems. The sustainable development goals are presented as a unique opportunity for a paradigm shift to a fully integrated approach to health. A convergence of the various movements that support this, including One Health, EcoHealth, Planetary Health and Ecological Public health, is called for.
- Chapter 3 gives a step-by-step protocol to be used when designing evaluations for One Health initiatives with key steps of:
  - defining the system/context;
  - describing and characterising the One Health Initiative;
  - describing the theory of change and expected/unexpected outcomes;
  - selecting the outcomes and metrics;
  - assessment of One Health-ness including One Health planning, working, systemic organisation, learning infrastructure, sharing infrastructure and the One Health index;
  - reviewing, planning and conducting the evaluation.
- Chapters 4-6 investigate methods and metrics utilized for the relevant outcomes of interest for three dimensions of ecology, society and the economy.
- Chapter 7 examines the integration of outcomes in the various dimensions and discusses the governance of One Health focusing in particular on knowledge integration within One Health policy cycles.

Our intention of this guide is to provide a methodology that will be regularly used with results reported with a common format. Once results and publications begin to flow it will be possible to establish a longitudinal database of that can be further analysed for trends in the value of One Health over time and in different regions.

Acknowledgements

This chapter is based upon work from COST Action 'Network for Evaluation of One Health' (TD1404), supported by COST (European Cooperation in Science and Technology).

References

Babo Martins, S., Rushton, J. and Staerk, K.D.C., 2015. Economic assessment of zoonoses surveillance in a 'One Health' context: a conceptual framework. Zoonoses Public Health 63(5): 386-395.

Charron, D.F.E., 2012. Ecohealth research in practice. Springer, New York, NY, USA.

Cleaveland, S., Kaare, M., Knobel, D. and Laurenson, M.K., 2006. Canine vaccination – providing broader benefits for disease control. Vet Microbiol 117(1): 43-50.

Coker, R., Rushton, J., Mounier-Jack, S., Karimuribo, E., Lutumba, P., Kambarage, D., Pfeiffer, D., Stärk, K. and Rweyemamu, M., 2011. Towards a conceptual framework to support 'One Health' research and policy: health systems and the human – animal interface. Lancet Infect Dis 11(4): 326-331.

Costanza, R., Norton, B. and Haskell, B.J., 1992. Ecosystem health: new goals for environmental management. Island Press, Washington, DC, USA.

Drummond, M.F., Sculpher, M.J., Torrance, G.W., O'Brien, B. and Stoddart, G.L., 2005. Methods for the economic evaluation of health care, 3rd edition. Oxford University Press, Oxford, UK.

FAO, 2013. World livestock 2013: changing disease landscapes. FAO, Rome, Italy. Available at: www.fao.org/docrep/019/i3440e/i3440e.pdf.

Farm Animal Welfare Council (FAWC), 2012. Five freedoms. Available at: https://tinyurl.com/y9r8wzjz.

Gittinger, J.P., 1982. Economic analysis of agricultural projects, 2nd edition. World Bank, Washington, DC, USA, 505 pp.

Häsler, B., Hiby, E., Gilbert, W., Obeyesekere, N., Bennani, H. and Rushton, J., 2014. A one health framework for the evaluation of rabies control programmes: a case study from Colombo City, Sri Lanka. PLoS Negl Trop Dis 8(10): e3270.

Manlove, K.R., Walker, J.G., Craft, M.E., Huyvaert, K.P., Joseph, M.B., Miller, R.S., Pauline Nol, Patyk, K.A., O'Brien, D., Walsh, D.P. and Cross, P.C., 2016. 'One Health' or three? Publication silos among the one health disciplines. PLoS Biol 14(4): e1002448.

Murray, C., 1994. Quantifying the burden of disease: the technical basis for disability-adjusted life years. Bull World Health Organ 72(3): 429-445.

O'Neill, J., 2016. Tackling drug-resistance infection globally: final report and recommendations. The review of antimicrobial resistance. Available at: http://tinyurl.com/zxxjmww.

TEEB, 2015. The economics of ecosystems and biodiversity for agriculture and food: towards a global study on the economics of eco-agri-food systems. Available at: http://tinyurl.com/ydewwye9.

Torgerson, P.R., Rüegg, S., Devleesschauwer, B., Abela-Ridder, B., Havelaar, A.H., Shaw, A.P.M., Rushton, J. and Speybroeck, N., 2017. zDALY: an adjusted indicator to estimate the burden of zoonotic diseases. One Health 5: 40-45.

Tzoulas, K., Korpela, K., Venn, S., Yli-Pelkonen, V., Ka´zmierczak, A., Niemela, J. and James, P., 2007. Promoting ecosystem and human health in urban areas using Green Infrastructure: a literature review. Landsc Urban Plan 81: 167-178.

Wilkinson, L., 1992. Animals & disease. An introduction to the history of comparative medicine. Cambridge University Press, Cambridge, UK, 272 pp.

Winpenny, J.T., 1991. Values for the environment. A guide to economic appraisal. Overseas Development Institute, HMSO, London, UK, 277 pp.

World Bank, 2018. One Health: operational framework for strengthening human, animal, and environmental public health systems at their interface. World Bank, Washington, DC, USA, 138 pp.

Zinsstag, J., Schelling, E., Waltner-Toews, D., Whittaker, M. and Tanner, M., 2015. One Health: the theory and practice of integrated health approaches. CABI, Wallingford, Oxfordshire, UK.

Zinsstag, J., Schelling, E., Wyss, K. and Bechir, M., 2005. Potential of cooperation between human and animal health to strengthen health systems. Lancet 366(9503): 2142-2145.

Zinsstag, J., Crump, L. and Winkler, L.S., 2017. Biological threats from a 'One Health' perspective. Rev Sci Tech Off Int Epiz 36(2): 671-680.